

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE APPLICATION BY CROCKER WIND FARM, LLC FOR A
PERMIT FOR A WIND ENERGY FACILITY AND A 345 KV TRANSMISSION LINE
IN CLARK COUNTY, SOUTH DAKOTA, FOR CROCKER WIND FARM

SD PUC DOCKET EL-17-055

PREFILED REBUTTAL TESTIMONY OF EDDIE DUNCAN
ON BEHALF OF CROCKER WIND FARM, LLC

April 13, 2018



1 **I. INTRODUCTION AND QUALIFICATIONS**

2

3 **Q. Please state your name.**

4 A. My name is Eddie Duncan.

5

6 **Q. Did you provide Direct Testimony in this Docket on December 15, 2017?**

7 A. Yes.

8

9 **Q. What is the purpose of your Rebuttal Testimony?**

10 A. The purpose of my Rebuttal Testimony is to respond to the testimony of David
11 Hessler submitted on behalf of the South Dakota Public Utilities Commission Staff
12 (“Staff”).

13

14 **II. RESPONSE TO TESTIMONY OF DAVID HESSLER**

15

16 **Q. What is your overall response to Mr. Hessler’s testimony?**

17 A. I appreciate Mr. Hessler’s conclusion that our work was satisfactory and consistent
18 with good industry practice (see p. 3, ln. 11-14). He also appears to agree with our
19 assessment that all residences would meet the sound level standard required by
20 Clark County (see p. 4, ln. 10-12). However, in portions of Mr. Hessler’s testimony,
21 he goes beyond evaluating the objective noise standard required by Clark County
22 and, instead, focuses on the potential reactions to and perception of individuals to
23 the sound produced. I do not agree that evaluating potential reactions of individuals
24 is a necessary or a valuable exercise in evaluating whether the project will meet the
25 Clark County noise standard or the applicable requirements of the South Dakota
26 Public Utilities Commission.

27

28 **Q. Mr. Hessler critiques your analysis for not “assessing or addressing in any
29 way the potential for an adverse community reaction to project noise.” Do you
30 agree with this criticism?**

1 A. I agree that our analysis did not do the assessment that Mr. Hessler suggests, but I
2 do not agree that it should have done so. RSG's analysis measured the Project's
3 anticipated sound level in order to determine whether the Project will comply with
4 Clark County's noise limit of 50 dBA, average A-weighted sound pressure at the
5 perimeter of the primary and accessory structures of off-site residences, businesses,
6 and government buildings. Thus, RSG conducted an objective, scientifically-based
7 analysis to determine compliance with the County's specifically adopted noise
8 standard. By contrast, a community's reaction (whether negative or positive) to
9 sound is partly subjective, and is based on a number of factors other than the sound
10 level actually produced. Thus, it is not the applicable standard.

11
12 **Q. Please explain further the difficulties in basing sound limits on potential**
13 **community reactions.**

14 A. Gauging sound level appropriateness based on community perception is extremely
15 difficult to assess scientifically, and may well vary from community to community. As
16 stated above, perception of sound is based on a number of factors other than the
17 actual sound level produced. For example, recent studies found that an individual's
18 annoyance with a wind project's sound is correlated with age, prior support or
19 opposition to a wind project, visual appearance, perceived fairness in the permitting
20 process, personal financial benefit from a wind project, and reported noise sensitivity
21 of the individual.¹ In other words, projected sound levels are only one of many
22 factors that determine an individual's reaction to a project, and it is not even the
23 strongest factor of those mentioned.

24

¹ Michaud, David S., et. al. "Personal and situational variables associated with wind turbine noise annoyance." J. Acoust. Soc. Am. 139 (3), March 2016.

Haac, R., K. Kaliski, M. Landis, B. Hoen, J. Firestone, J. Rand. (2018) *Predicting audibility of and annoyance to wind power project sounds using modeled sound*. Lawrence Berkley National Laboratory. Preliminary Results Webinar. February 27, 2018.

1 **Q. Setting aside the subjective rationale behind Mr. Hessler’s proposed sound**
2 **level, can you explain how Mr. Hessler’s 45 dBA sound level relates to the**
3 **modeling you completed to determine if the Project will meet the County’s 50**
4 **dBA standard?**

5 A. Based on my familiarity with Mr. Hessler’s work, it is my understanding that the 45
6 dBA level that Mr. Hessler proposes does not take into account some of the
7 conservativeness factored into RSG’s modeling for the Project. There are three key
8 differences between Mr. Hessler’s proposed 45 dBA standard and the sound levels
9 modeled by RSG:

10 • Long-Term Average vs. Hourly Average: Mr. Hessler’s proposed 45 dBA
11 limit is a long-term-average sound level, meaning that it is an average
12 sound level measured over a period of time, such as over a couple of
13 weeks. During that time period, the sound level may be above 45 dBA, or
14 below 45 dBA, but the median sound level must not exceed 45 dBA.
15 RSG’s modeling, on the other hand, predicted sound levels over a one
16 hour period. Given the shorter time period, RSG identified anticipated
17 maximum hourly average sound levels that would typically be higher than
18 long-term average sound levels.

19 • Uncertainty Factor: RSG included the turbine manufacturers’ 2 dBA
20 uncertainty factor, which is a recommendation that 2 dBA be added to a
21 turbine model’s projected sound level to account for potential uncertainty
22 in the actual sound level the turbine will produce. However, to predict the
23 long-term average (for which Mr. Hessler references 45 dBA), the 2 dBA
24 uncertainty factor would not be included in the model.

25 • Operational/Downwind Assumptions: RSG assumed all turbines were
26 operating all the time, and all receivers were downwind (per ISO 9613-2)
27 all the time. Since this could not physically occur, conservativeness is
28 built into the model. However, Mr. Hessler’s 45 dBA is based on sound
29 measurements at actual wind farms, at which all turbines may not have

1 been operating, and where the points of measurement were not always
2 downwind.

3 Overall, when the above factors are considered, RSG's modeled sound levels for the
4 Project are likely between 3 and 6 dBA more conservative than the 45 dBA standard
5 offered by Mr. Hessler. In other words, if RSG had used Mr. Hessler's long-term
6 average approach to model anticipated sound levels for the Project, the modeled
7 sound levels for the Project would be less than the conservative maximum hourly
8 average metric and mode assumptions used by RSG. For instance, if RSG's
9 modeling results for the Project indicated a maximum hourly sound level of 47 dBA
10 at a given receptor, that same receptor may have a sound level of between 41 dBA
11 and 44 dBA under Mr. Hessler's modeling assumptions. Given the differences in the
12 modeling assumptions, Mr. Hessler's offered standard should not be directly applied
13 to RGS's modeled maximum hourly sound levels for the Project.

14
15 **Q. On page 4 of his testimony, Mr. Hessler is asked if the County's sound level**
16 **requirement would "automatically protect the community from harm." Do you**
17 **have thoughts regarding Mr. Hessler's response?**

18 A. Although the question asks about "harm," it appears that Mr. Hessler's response is
19 directed at the "possibility of complaints and dissatisfaction," rather than physical
20 harm (p. 4, ln. 8). While I agree that there is always the possibility for an individual
21 to complain about sound levels, I would not agree that complaints are equal to harm
22 or necessarily caused by sound level. As Mr. Hessler states, "I think the only
23 reasonable conclusion that can be drawn is that adverse health impacts associated
24 with the Crocker Wind project are highly improbable" (p. 8, ln. 7-9).

25
26 **Q. Mr. Hessler comments on RSG's use of background (ambient) sound levels.**
27 **What was the purpose of measuring ambient sound levels in the Project area?**

28 A. RSG measured ambient sound levels in and around the Project in order to establish
29 baseline sound levels. Once a Project is operational, it is difficult to obtain
30 background level data, so it is appropriate to measure the levels in advance.

1 **Q. Do you agree with Mr. Hessler’s recommendation that relative sound**
2 **increases should be limited to 5 dBA?**

3 A. No. Mr. Hessler states that a 5 dBA increase is often used as a “design target”
4 because that change is generally considered “moderately perceptible” (p. 8, ln. 17-
5 18). I agree with Mr. Hessler that a 5 dBA change in sound level is generally
6 considered moderately perceptible, but I do not agree that limiting sound levels to a
7 5 dBA increase above ambient is a good design target for a project. Often a 5 dBA
8 change in sound level is used to determine whether or not mitigation is worth
9 implementing or not. That is, if a proposed mitigation measure decreases sound by
10 5 dBA or more, it would generally be considered worth implementing, if needed.
11 What Mr. Hessler seems to assert is that a sound level limit or design goal for the
12 project should be 5 dBA above existing ambient sound levels. This is what is
13 referred to as a relative standard. It is in contrast to the Clark County sound
14 standard of 50 dBA, which is typically referred to as an absolute or fixed standard.
15 There are a number of issues related to relative noise standards that make them
16 problematic.

17
18 **Q. Why would you not recommend a relative noise limit?**

19 A. RSG recommends that noise limits follow four principles. First, a limit should be
20 relevant. That is, it should not be set arbitrarily, but rather, have some relevance to
21 the impacts one seeks to protect. Secondly, the metrics and procedures should be
22 repeatable, resulting in a relatively low standard deviation among samples taken.
23 Thirdly, the limit should be predictable with a high level of confidence and reliability.
24 Lastly, it should be easy to implement and tested.

25
26 In contrast to these principles, a relative noise standard by definition is arbitrary. It
27 does not point to a specific impact that it tries to address. A 5 dBA change in sound
28 level only tests whether or not the source of sound will be moderately perceptible
29 above existing background sound levels; that is, will it be audible. Whether
30 something will be audible is not commonly considered an impact. Relative noise
31 standards are also difficult to repeat and predict due to the fact that background

1 sound levels are constantly changing. They are influenced by a wide array of
2 geophonic, biogenic, and anthropogenic processes that are constantly changing in
3 the environment. These also change from place to place, so it is impossible to
4 forecast in advance what the background sound level is in all places at all times now
5 and in the future. Mr. Hessler acknowledges some of these issues by stating that
6 the ambient L90 sound levels RSG monitored during preconstruction monitoring
7 were 15 to 21 dBA, but he also states that those levels were collected “during low
8 wind conditions” (p. 9, ln. 3-5, 11-15). That is, those low sound levels occur during
9 times when winds are so low that the Project is unlikely to produce much sound. As
10 wind speeds increase, so will sound levels from both background sound and the
11 Project. For these reasons, I would not recommend a relative noise limit.

1 **III. CONCLUSION**

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3 **Q. Does this conclude your Rebuttal Testimony?**

4 A. Yes.

5

6 Dated this 13th day of April, 2018.

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8



9 Eddie Duncan